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**INDUSTRY STANDARD OF THE  
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**Technical specification for gas detecting in SF<sub>6</sub> gas mixture  
insulated equipment  
(English Translation)**

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### Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

Please note that certain contents of this document may involve patents. The issuing agency of this document is not responsible for identifying these patents.

This standard was proposed by the China Electricity Council.

This standard is under the jurisdiction of the National Electrochemical Standards Technical Committee.

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### 1 Scope

This standard specifies the testing items, testing period and testing methods of SF<sub>6</sub> mixed gas in electrical equipment law.

This standard applies to the detection of SF<sub>6</sub>/CF<sub>4</sub> and SF<sub>6</sub>/N<sub>2</sub> mixed gases in electrical equipment.

## 2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version Applies to this document. For undated references, the latest version (including all amendments) applies to this document.

GB/T 8905 Guidelines for Gas Management and Detection in Electrical Equipment of Sulfur Hexafluoride GB 11023 High-voltage switchgear sulfur hexafluoride gas tightness test method DL/T 506 Insulating gas humidity measurement method in sulphur hexafluoride electrical equipment DL/T 639 Safety protection guidelines for personnel operating, testing and overhauling sulfur hexafluoride electrical equipment DL/T 916 Determination of acidity of sulfur hexafluoride gas DL/T 918 Determination of hydrolyzable fluoride content in sulfur hexafluoride gas DL/T 919 Determination of mineral oil content in sulfur hexafluoride gas (infrared spectroscopy method) DL/T 921 Biological test method for toxicity of sulfur hexafluoride gas DL/T 1032 Sulfur hexafluoride (SF<sub>6</sub>) gas sampling method for electrical equipment DL/T 1205 Test method for decomposition products of sulfur hexafluoride electrical equipment DL/T 1823 On-site detection method of mineral oil, hydrolyzable fluoride and acidity in sulfur hexafluoride gas

## 3 Terms and definitions

The following terms and definitions apply to this document.

SF<sub>6</sub> gas mixture

SF<sub>6</sub> gas is an insulating gas mixed with another gas in a certain proportion.

SF<sub>6</sub> gas mixture insulated equipment Electrical equipment that uses SF<sub>6</sub> mixed gas as an insulating medium.

Gas mixture rate

The volume fraction of SF<sub>6</sub> in the SF<sub>6</sub> mixed gas.

Noise equivalent temperature difference (NETD) noise equivalent temperature difference an objective evaluation method for the imaging quality of infrared thermal imaging systems. Infrared thermal imaging camera observes a low spatial frequency for a round or square target, when the signal-to-noise ratio (S/N) of its video signal is 1, the equivalent temperature difference between the target and the background.

## 4 Testing items, testing cycle and testing methods

The gas detection items, detection cycles and detection methods of mixed gas insulation equipment are shown in Table 1.

## 5 Sampling

### 5.1

On-site analysis and sampling Connect the pipeline according to the requirements of the testing instrument, adopt the lead-in sampling, flush the pipeline for 3 to 5 minutes, and then sample for testing.

### 5.2 Laboratory analysis and sampling

Follow the relevant regulations in DL/T 1032.

#### 6.1.1.1 Method summary

Use thermal conductivity or infrared sensor to detect the difference in thermal conductivity or infrared absorption characteristics between SF<sub>6</sub> and another gas the mixing ratio of the mixed gas; at the same time, an electrochemical sensor is used to detect the O<sub>2</sub> content in the gas. The detection process is shown in Figure 1.

#### 6.1.1.2 Instrument requirements

The sensor method gas mixture ratio detector should meet the following conditions.

- a) Detection components. SF<sub>6</sub>, O<sub>2</sub>;
  - b) Sensor type. thermal conductivity or infrared sensor should be used for SF<sub>6</sub> detection, and electrochemical sensor should be used for O<sub>2</sub> detection;
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- c) Detection range. SF<sub>6</sub> content (volume fraction) 0~100%, O<sub>2</sub> content (volume fraction) 0~1%;
  - d) Detection error. SF<sub>6</sub> ≤ ±1% (volume fraction), O<sub>2</sub> ≤ ±0.1% (volume fraction);
  - e) Response time. ≤ 1 min;
  - f) Temperature control accuracy. ±0.1°C;
  - g) There should be optional gears such as SF<sub>6</sub>/CF<sub>4</sub> and SF<sub>6</sub>/N<sub>2</sub>, which can be used after calibration, and the calibration period should not exceed 1 year.

#### 6.1.1.3 Environmental conditions

- a) Temperature. -10°C~40°C;
- b) Humidity. ≤ 85%RH.

#### 6.1.1.4 Test procedure

Operate as follows.

- a) Turn on the power of the instrument, and perform the corresponding settings according to the instructions after the instrument has been warmed up;
- b) Confirm that the air inlet valve of the instrument is in the closed state, connect the air inlet of the air source and the sampling port of the instrument, and connect the exhaust gas collection device Connect to the exhaust port of the instrument;
- c) During measurement, keep the oxygen sensor protection valve in the closed state, slowly open the gas flow regulating valve, and open the side Valve, flush the pipeline for 3 min~5 min, then adjust the gas flow to the setting range and open the protection valve to start After the test data is stable, record the SF<sub>6</sub> and O<sub>2</sub> test results;
- d) After the measurement is completed, the instrument should be purged with dry nitrogen for 3 min~5 min, first close the oxygen sensor protection valve, and then Turn off the instrument;
- e) Recycle the gas in the exhaust gas collection device.

#### 6.1.1.5 Test results

Take the arithmetic mean of two parallel determination results as the test result, and the test result is expressed in volume fraction.

#### 6.1.1.6 Precision

The absolute deviation of the two test results is SF<sub>6</sub>≤1%, O<sub>2</sub>≤0.1%.

#### 6.1.2.1 Method summary

The chromatographic column is used to separate SF<sub>6</sub>, CF<sub>4</sub>, N<sub>2</sub>, O<sub>2</sub> and other components, and the gas of each component is entered through a thermal conductivity detector (TCD).

Line testing. The test result is expressed in volume fraction.

#### 6.1.2.2 Apparatus and materials

- a) Gas chromatograph. It should be equipped with a TCD detector, which can detect SF<sub>6</sub>, CF<sub>4</sub>, N<sub>2</sub>, O<sub>2</sub> and other components, and can be used Data analysis is carried out by external standard method and calibration standardization method. See Table 2 for typical gas path flow.
- b) Carrier gas. helium, with a purity of not less than 99.999%;
- c) Standard gas. It should be prepared by a unit authorized by the national metrology